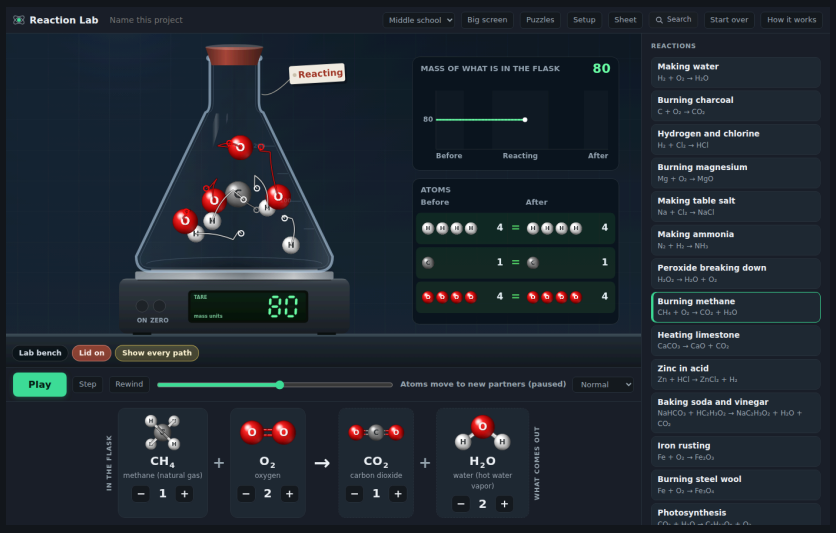
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Reaction Lab: Where Did the Atoms Go?

Grades 6-8 · 45 minutes

Physical science · Chemistry



Slides, rubric and answer key | Print and go | No student accounts | Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and an atom-counting table
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school chemistry
- Standards: NGSS

Reaction Lab: Where Did the Atoms Go?

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Students put hydrogen and oxygen in a sealed flask on a scale and press React before balancing anything: an oxygen atom vanishes and the scale drops, which cannot happen. They fix the equation by adding whole molecules, follow one atom through the reaction, and then balance burning methane on their own.

At a glance

ESSENTIAL QUESTION

When a reaction makes new substances, where do the atoms of the old ones go?

OBJECTIVES

Students will be able to:

- count the atoms of each kind on both sides of a reaction with a model
- balance an equation by adding and taking away whole molecules, never changing a formula
- follow one atom from a reactant molecule into a product molecule
- explain why the mass stays the same in a sealed container when the number of molecules changes

VOCABULARY

Atom, Molecule, Reactant, Product, Conservation of mass

STANDARDS

MS-PS1-5, MS-PS1-1

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/reactionlab?lesson=where-did-the-atoms-go&ref=tpt-reactionlab-1 once on a student computer: it opens on Making water with one of each molecule, and checks that your school's filter allows the app. Run water both ways yourself, about five minutes: press React as it opens, then add one hydrogen and one water molecule and press React again.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: where did the rest of the log go? Write every answer on the board without judging it.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app with the starter open. Point at the scale: 34 mass units. Press React before changing anything. An oxygen atom fades out and the scale drops to 18. Ask: can an atom disappear? Show An equation that cannot be true, then Count the atoms, not the molecules. > **It's working when:** Do not fix the equation yet. Let the class sit with the wrong scale for a moment; the fix lands harder when they make it themselves.	Watch, and fill in the vocabulary on the worksheet.
12 to 22	**Guided practice (We do)** Making water together	Students open the link or scan the QR code. A short guide walks them through: React, add a hydrogen molecule, add a water molecule, tap an oxygen atom, React. Check that every scale reads 36 before and after. > **Watch for:** Students who try to change the small 2 in H_2O. The app will not let them, and its card explains why. Ask them what H_2O_2 is.	Balance water, follow an oxygen atom, and fill in the first row of the atom-counting table.
22 to 38	**Independent practice (You do)** Burning methane	Students open Burning methane from the shelf and balance it on their own, then follow the carbon atom. Walk the room with the What to look for questions. > **If they ask:** "Three molecules went in and three came out of methane. Did the number of molecules have to match?" Molecules	Balance methane, follow the carbon atom, and fill in the second row of the table with the counts and the mass.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Two students say where their carbon atom went. Go back to the warm-up answers about the log: the atoms went into the air as gases. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/reactionlab?lesson=where-did-the-atoms-go&ref=tpt-reactionlab-1. A short guide opens over the app. A sealed flask on a scale holds one hydrogen molecule and one oxygen molecule; under it the equation is a row of cards with + and − buttons.

1. **Run it unbalanced.** Press `React`. The molecules bump, their bonds let go, and the atoms move to make one water molecule. The second oxygen atom has nowhere to go: it fades, a red ghost stays where it was, and the scale drops to 18.
2. **Balance it.** Press + under hydrogen and + under water. The Atoms card shows an equals sign on both rows. Press `React`: the scale holds at 36.
3. **Follow an atom.** Rewind, tap any atom, and press `React`. Its path stays drawn. `Show every path` draws them all.
4. **Methane.** Pick Burning methane on the shelf. The answer is one methane and two oxygen molecules making one carbon dioxide and two water molecules; the scale reads 80.

> The moment that lands is the first React. Students have been told mass is conserved; here an equation breaks the rule in front of them, and they see that the equation was wrong, not the atoms.

Background for the teacher

In a chemical reaction the atoms of the starting substances regroup into different molecules. No atom is made or destroyed, and each kind of atom has its own mass wherever it is, so the total mass in a sealed container does not change. That is MS-PS1-5. The number of molecules can change: two hydrogen molecules and one oxygen molecule make two water molecules, three in and two out.

A balanced equation has the same number of each kind of atom on both sides. Students balance by changing how many whole molecules there are, never the small numbers in a formula, which would make a different substance: H_2O_2 is hydrogen peroxide. The app locks those numbers and says so when a student tries.

Common mistakes: counting molecules instead of atoms; matching the total number of atoms instead of each kind; and thinking the flame or the light adds or removes mass. The app shows light and heat but never weighs them.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- Point to the oxygen row in the Atoms card. How many before, how many after?
- Why could you not just change H_2O to H_2O_2?
- Three molecules became two. Why did the scale not change?
- Where did your followed atom end up?
- What would the scale do if an atom really vanished?

> The third question is the real test: a student who says the atoms are the same, only joined differently, has the idea.

Cross-curricular extensions

- Math: the scale reads 36 for water. Using hydrogen 1 and oxygen 16, show where 36 comes from.
- History: read about Antoine Lavoisier, who weighed reactions in sealed containers in the 1770s.
- English: write the reaction as a short story told by one oxygen atom.
- Life science: balance photosynthesis and say where the oxygen we breathe comes from.

Vocabulary

Atom	The smallest piece of an element. In the app each atom is a colored ball with its letter: H is hydrogen, O is oxygen, C is carbon.
Molecule	A few atoms held together by bonds, the sticks between the balls.
Reactant	A substance you start with, the molecules in the flask before the reaction.
Product	A new substance the reaction makes.
Conservation of mass	In a sealed container the total mass stays the same in a reaction, because the same atoms are still there.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the atoms on the board as you say each word: the letters on the balls carry the meaning.
- Pair each learner with a partner for water; the balancing is pressing + until two rows say =.
- Accept the table as numbers and the equals signs, without sentences.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students for methane, one counting atoms on the card and one pressing the buttons.
- Zoom the browser to 150%; the flask and the cards stay readable.
- Allow water alone, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "The mass stayed the same because ___."
- A check-in after water: every student has 36 and 36 before anyone opens methane.
- Leave the Atoms card visible and ask only for the equals signs.

STUDENTS READY FOR MORE

- Balance Burning propane at the high school level (Setup, high school) and compare the masses in atomic mass units.
- Turn on Show every path and explain why two atoms of the same kind could have swapped places.
- Balance photosynthesis and say what it has in common with burning methane.

Adapting for other grades

Younger students: In grades 4 and 5, do water together and stop there; skip the following step and the third rubric row; total 8, and 6 meets the objectives.

Older students: In high school chemistry, open Setup and pick high school: students type the numbers, the scale reads in atomic mass units, and they add the mass of each side by hand on the back of the worksheet.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/reactionlab?lesson=where-did-the-atoms-go

Essential question: When a reaction makes new substances, where do the atoms of the old ones go?

Warm-up: You burn a log and a pile of ash is left. Where did the rest of the log go? _____

1. **Vocabulary.** Atom, molecule, reactant, product, conservation of mass: write each in your own words.

2. **The atom-counting table.** For each reaction: atoms of each kind before _____; after _____; molecules before ____ and after ____; mass before ____ and after ____; the balanced equation _____. Water on the first line, methane on the second.

3. **Follow an atom.** The atom I followed: _____. It started in a _____ molecule and ended in a _____ molecule.

1. Three molecules went in and two came out. Why did the mass not change?

2. Why can you not balance an equation by changing the small numbers in a formula?

Reaction Lab: Where Did the Atoms Go?

Exit ticket

Name: _____

1. In a sealed flask, what stays the same in every chemical reaction? (A) the number of molecules (B) the number of each kind of atom (C) the substances

2. $2\ H_2 + O_2 \rightarrow 2\ H_2O$. How many oxygen atoms are on each side? (A) 1 and 2 (B) 2 and 2 (C) 2 and 4

3. A reaction in a sealed bag starts at 50 grams. What does the scale read after, and why?

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	Atoms are not made or destroyed. Molecules can change in number and the substances change.
2	B	One O_2 molecule has 2 oxygen atoms; two H_2O molecules have 1 each.
3	50 grams	The same atoms are in the bag, and each kind of atom keeps its mass. A full answer names the atoms; 50 grams alone is half.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Atom counts	Both tables complete and correct, each kind counted on both sides, with the molecules counted too.	Both tables correct for the atoms.	One table correct.	No counts, or counts of molecules only.
Balancing	Water and methane balanced with whole molecules, in lowest whole numbers, written as equations.	Both balanced.	Water balanced, methane not.	Neither balanced, or a formula changed.
Explanation	Explains the same mass by the same atoms and says why the molecules can change in number.	Explains the same mass by the same atoms.	Says the mass stayed the same with no reason.	No explanation, or says atoms were made or destroyed.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-PS1-5, with the molecules as models for MS-PS1-1.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-PS1-5**	6-8	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	Students use a digital model of atoms in a sealed flask to show the number of each kind of atom and the mass stay the same.
NGSS	**MS-PS1-1**	6-8	Develop models to describe the atomic composition of simple molecules and extended structures.	Water, methane, oxygen and carbon dioxide are shown as ball-and-stick models of their atoms.

Checked November 2026 against: NGSS MS-PS1-5, Matter and its Interactions, NGSS MS-PS1-1, Matter and its Interactions.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/reaction-lab/lessons/where-did-the-atoms-go/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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